Islam DMZ, Eidhammer O.

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Advances in the competitiveness of pan-European rail freight services: findings from a case study

Dr Dewan Md Zahurul Islam[a] and Olav Eidhammer[b],

[a]*Freight Logistics Research Group, NewRail - Centre for Railway Research, University of Newcastle Upon Tyne, NE1 7RU, UK, Email: dewan.islam@newcastle.ac.uk*

[b]*Institute of Transport Economics, Gaustadalleen 21, NO 0349 Oslo, Norway, Email: Olav.Eidhammer@toi.no.*

Biographical notes:
Dr Dewan Md Zahurul Islam is a Researcher and Academic within NewRail - Centre for Railway Research at Newcastle University, UK. He has over two decades of working and research experience in the fields of intermodal freight transport, sustainable logistics, urban logistics, benchmarking, ICT, and supply chain management for developed and developing countries. His PhD research was on the International Freight Transport Multimodal Development for Developing Countries. Before this he worked for about ten years in the Government of Bangladesh in Planning Department for the transport sector - ports, shipping and inland waterways. Currently he teaches International Logistics and Supply Chain Management for postgraduate courses. He has participated as a partner in many EU and UK funded research projects in the fields of intermodal freight transport, logistics, rail freight, and port centric logistics. He has authored and co-authored many conference and peer reviewed journal papers and research reports.

Olav Eidhammer is a Senior Research Economist at the Institute of Transport Economics, Gaustadalleen 21, NO 0349 Oslo, Norway. He has long experience in conducting research and project management in the transport sector in general and rail freight transport in particular. He was a lead manager for implementing research projects such as REORIENT, RETRACK.

Abstract
The European rail freight market is ostensibly a free market where, from 1 January 2007, both incumbent and new-entrant operators are able to compete on every line and in every European Union country. The main objective of this research paper is to assess the advances in the competitiveness of the pan-European rail freight services operated by a new-entrant (private) operator. Its main focus is to assess and contribute to the understanding of the advances towards competitiveness and the future prospects in the open European rail freight market, including dealing with challenges (e.g. dormant and departure of partners, suspension of the project, indistinct roles and responsibilities of operating partners) at different phases of the research, development and service offerings, that will be an important contribution to the Research and Development (R&D) policy and management arena in the Europe rail freight transport sector. The current research applies a case study research approach. The assessment of the rail freight service is performed by conducting two phases: first, a comparison of the progress between first and second year of the REorganisation of Transport networks by

advanced RAil freight Concepts (RETRACK) rail freight service, operated by a new entrant and conducted on the corridor between two hubs – Cologne, Germany, and Györ, Hungary, and secondly a comparison of the opinions of customers on the RETRACK service and its competitors. From the comparative study between the first and second years, the study finds that the new-entrant operator was able to offer an increased number of services by consolidating cargo from satellite connections at both ends of the operational corridor by adopting a pragmatic and flexible approach. The customer satisfaction survey suggests that the new-entrant operator offered better service in terms of price, transit time, reliability and information flow/management compared to its competitors' services (offered by incumbent rail operators) on the corridor. However, their service was inferior to that of its competitors, in terms of frequency and availability of service. These less-well performed service factors have improved gradually over time. The study suggests that intra-rail competition has improved, but that inter-modal completion is yet to be achieved. The ups and downs of the project provide important lessons for R&D management, academia and policy makers. The study suggests that a pan-European rail freight service can be efficiently and effectively run by new-entrant operators, and this will lead to more intra-modal competition. However, they have yet to achieve competitiveness that will result in a shift of cargo from road to rail by offering an improved service that at least matches the major attributes of road freight service, e.g. price, transit time, door-to-door service and working in a collaborative way with other actors.

Keywords: pan-European; rail freight operations, incumbent, new entrant operators, competitiveness, quality, reliability; wagon load;

1. INTRODUCTION

The competitiveness of European Union (EU) economies depends on many important factors, including an efficient freight transport system. The European rail freight market is ostensibly a free market where, since 1 January 2007, both incumbent and new-entrant operators are able to compete on every line and in every EU country. Competition in a competitive environment is an indisputable need for the building of an efficient freight transport sector (CER, 2008). Asteris and Collins (2010 p.171) opine that 'Rail freight competitiveness hinges on length of haul, as well as rail connectivity at origin and destination.' Brewer (1996 p. 92) opines that: 'It is possible to get the benefits of competition without the requirement of a large number of competing firms.' This is true in the case of intra-rail competition, as only a limited number of companies can be allowed to run on a railway; this is due to, among other things, path allocation and time-tabling, which is approved long before the actual service operation. This is particularly crucial in the European rail network, where both passenger and freight trains run, each having different aims and operational characteristics. Johnson and Nash (2012 p.1) note that: 'The policy of the European Commission is to introduce competition within the rail sector, and this has already been implemented for freight services.' The EU Transport White Paper 2001 set a strategy that the competition policy will 'ensure that opening up of the market, especially in the rail sector, is not held back by dominant companies already operating on the market and does not translate into poorer quality public services' and that 'transport research policy will make the various efforts made at Community, national and private level more consistent, along the lines of the European research area' (European Commission, 2001 p. 15). The mid-term review of the 2001 White Paper set similar transport policy objectives and states that: 'Efficiency gains supported by EU policies will make notably rail and waterborne transport more competitive,

in particular on longer routes' (EC, 2006 p. 7). In line with this EU R&D policy, the EC funded the RETRACK project, at the Community level, under its sixth framework Programme, to help address the issue of competition, by supporting new entrant rail operators. An important objective of the RETRACK project was to demonstrate that a new entrant (non-incumbent) owned and operated rail freight service was achievable on a pan-European long distance corridor using the freedoms endowed by the Railway Reform Packages introduced by the EC (RETRACK, 2012). The inherent objective was to achieve a modal-shift from road to rail which is a key and long-lasting EU policy objective (EC, 2001; EC, 2006; EC, 2011).

1.1. Objective

The objective of this research paper is to assess the advances in the competitiveness of pan-European rail freight services run by new-entrant (private) operators, utilising a case study. At the different phases of research, development and service offerings, the paper's main focus is to assess and contribute to the understanding of such advances towards competitiveness and to discuss the future prospects of an open European rail freight market that will make an important contribution to Research and Development (R & D) policy and management in the Europe rail freight transport sector. The case study includes: the analyses; a comparison of the progress between first and second year of the RETRACK rail freight service conducted on the corridor between two hubs: Cologne, Germany and Györ, Hungary (see Figure 1); and a comparison of the opinions of customers on the RETRACK service and its competitors. The 'corridor concept' should be noted here. In order to better connect with the rest of the European networks, the Pan-European transport corridors concept was defined, at the Pan-European transport Conferences in Crete, 1994 and in Helsinki, 1997, as routes in Central and Eastern Europe that required major investments over the medium and long term. Also this corridor approach facilitates higher volume of cargo flow, for longer haul services. With this in mind, the RETRACK corridor was selected to connect the Western, Central and Eastern major cargo origins/destinations from/to Rotterdam Port – Europe's top sea port, connecting whole world - through 5 countries: The Netherlands; Germany; Austria; Hungary; and Romania. One of the objectives of the project was to extrapolate the experience of RETRACK to other Europe-wide other corridors and to contribute to EC policy objectives.

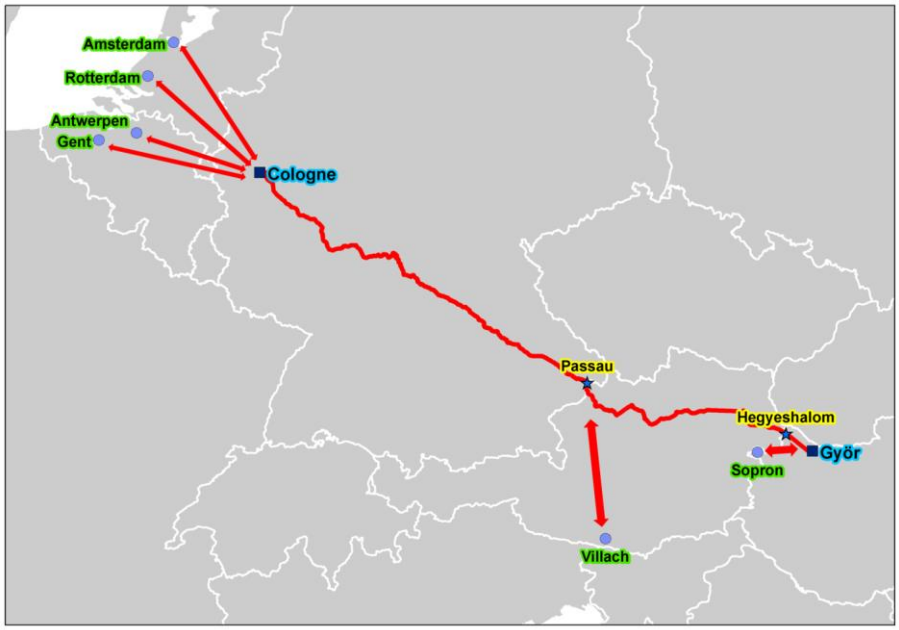

Fig. 1. RETRACK rail freight service corridor

1.2. Structure of the paper

Section 2 of this paper describes the state of the art, including: background information, in subsection 2.1; project management, in sub-section 2.2; pilot demonstration of the rail freight service, in sub-section 2.3; and progress beyond the state of the art, in sub-section 2.4. The research approach is discussed in section 3, followed by a discussion on the data collection template, data collection and analysis in section 4; while section 5 conducts a comparison of the RETRACK rail freight service, between the first and second year of operation, using pilot diary data. Section 6 conducts a comparison of RETRACK and competing rail freight services, using a customer satisfaction survey. Section 7 summarises the comparative assessment, with added focus on policy implications, and is followed by the drawing of conclusions and recommendations, in section 8.

2. STATE OF THE ART

Any freight transport system may include modal and multimodal transfer points, consolidation centres and uni-modal, multi-modal and urban freight transport service options. Each transport mode has its pros and cons when considering aspects such as distance, type of cargo, size of consignment, value of cargo etc. The production and consumption centres in Europe are densely populated, requiring a shorter transport haul that provides an inherent advantage to road freight services. Other factors, such as flexibility, door-to-door service, customer-responsiveness and customer-tailored services, have made the trucking industry attractive, dominant and essential in almost all European countries. Its market share, measured in tonne-kilometre (tkm), by volume or by weight, is increasing, while rail freight's share has been decreasing or stagnant for over 30 years (EC, 2012; Ludvigsen and Osland, 2009 p. 32; CER, 2013 p.31). One consequence of this is many highly congested road

transport corridors, in particular during peak hours, causing unreliable delivery of goods, which is counter-competitive for the European economies (EC, 2011).

Comparatively, rail (and waterways) transport is considered to be more environmentally friendly than road. Despite many improvements, such as improved aerodynamic truck design and newer engines (e.g. Euro 5) that emit comparatively less CO2, the road transport industry is responsible for the highest contribution of greenhouse gas (GHG) of all transport modes (EC, 2012; EC, 2011; EC, 2001). Competition and sustainability are two major policy objectives outlined in the Transport White Paper 2011 (EC, 2011 p.5). However, rail freight transport is sometimes seen as an unattractive mode that is non-responsive to the demands and needs of modern supply chains (although there are examples, in some Member States, of quality rail logistics services).

In the global competitive market, an integrated logistics system involves getting 'the right product, in the right direction, in the right quantity and right quality, in the right place at the right time, for the right customer at the right cost' (Mangan et al., 2012 p.9). However most railway undertakings lack the capability to offer such integrated pan-European logistics services. This is probably partly due to history. Gutiérrez et al. (2011, p. 840) noted that 'Historically, most European countries have given priority to the development of their national transport networks; this favoured the integration of their territories and the consolidation of truly national markets. In contrast, less attention was paid to links with other countries. The result, at the supranational level, was the existence of a set of independently developed national transport networks, weakly interconnected. In the context of progressive European integration, improving connections between member States constitutes a political priority.'

Rail freight (and passenger) services in Europe were government owned and operated and destined to serve within national boundaries, under strict government policy objectives. National railways in Europe carried one-third of the (road and rail) freight market in 1970, which dropped to one-fifth in 1990 (CER, 2008, p. 25-26). This drop is partly due to changes in the type of cargo available in the market (decline in heavy industry, resulting in less movement of raw materials; growth in consumer goods) and partly to a lack of response to such changes by the rail freight operators. Rail has remained top choice for low value cargo such as solid mineral fuels, ores and metal waste (CER, 2013 P.19) but has failed to make exhaustive efforts to capture low-density, high-value (LDHV) cargoes. In an attempt to increase market share through improved competitiveness, rail freight transport ownership and operation have been massively reformed, since 1991, through a series of Directives and through Railway Reform Packages, effecting a change from a command economy to a market-based, open, competitive one. So far it is true that the reform has not been introduced to the same degree in all countries (IBM 2011, p. 15) with many incumbent operators still government owned and operated in disguise, making it difficult to assess and compare the competitiveness of these operators with new-entrants. Also, data for such assessment are difficult to obtain. One of the major objectives of the EC's institutional and financial support is to explore the potential of alternative, comparatively sustainable transport modes, such as rail. Some major rail freight operators are increasingly showing interest in taking part in such research and innovation projects. As an example, Deutsche Bahn (DB) Schenker Rail (rail subsidiary of incumbent German operator DB) was a major partner in the CREAM (Technical and operational innovations implemented on a European rail freight corridor) project (2012), part-funded under FP6, which explored the commercial viability of rail freight services. Under the same programme, the RETRACK (REorganization of Transport Networks by

advanced Rail freight Concepts) project (2013) aimed to apply new business models for pan-European rail freight services on a West-East corridor (a part of the CREAM corridor) operated by new-entrant (non-incumbent or private) rail freight operators. The current paper evaluates the competitiveness and future prospects of the rail freight services.

2.1 Background information

The RETRACK project, conducted within the part-funded scheme of the European Commission (EC) under the 6th Framework Programme (FP) (under the Sub-Priority 1.6.2: Sustainable Surface Transport of Sustainable Development, Global Change and Ecosystem call topic), aimed at research, development, demonstration and implementation of a pan - European rail freight service along the West-East corridor linking the North Sea gateways to the Black Sea gateways, spreading from Rotterdam (Netherlands) to Constanza (Romania). The corridor passed through The Netherlands, Germany, Austria, Hungary and Romania and also connected to Belgium, Bulgaria and Turkey. However, in the changed market scenairoi (i.e. when many promised customers pulled out due to the recession in 2008) the RETRACK service had to change the origin/destination in the East from Constanza to Gyor in Hungary. The overall length of the corridor, between the farthest origins and destinations of the freight flows, was c1500 km, of which the main part, between Cologne (Germany) and Gyor (Hungary), was c1220 km. The project ran from May 2007 to August 2012 (RETRACK, 2013). Although originally approved for four years, it was extended several times and thus the project documents (description of works, widely known as DoW) was revised a number of times due to changed circumstances (e.g. new partner, recession, partner leaving), as we shall see later on. The RETRACK project involved a consortium of 18 partners from 9 countries, including new entrant, privately owned rail freight operators, experienced IT and training specialists and leading Research & Development organisations. The partners are listed below, together with their roles and responsibilities:

Table 1. RETRACK consortium with roles and responsibilities

No	RETRACK Partner	Roles and responsibilities
1	TNO - The Netherlands Organisation for applied scientific research, NL	Co-ordinator and work package leader in Work Package (WP) 1 (Logistics market requirements for new rail freight service); WP10 (Synthesis workshop); and WP12 (RETRACK knowledge base). Also a partner in other WPs.
2	BB Babcock & Brown, UK	Had a partner role but left the consortium at the beginning the of the project
3	EUB – European Bulls, NL	Had a partner role in WPs 1, 2 and 3 but subsequently wound down as an organisation and left before the rail freight service operation began.
4	DR- DeltaRail BV, NL	WP 5 Leader (Training) and partner in other WPs.
5	NewRail at Newcastle University, UK	Leader for WP2 (State of the art of European rail freight service on the corridor); WP6 (assessment of rail infrastructure and interoperability issues along the corridor); WP8 (Pilot demonstration); and WP11

		(Dissemination). Also a partner in WP1, WP3, WP4, WP9, WP10 and WP12.
6	TOI - Institute of Transport Economics, NO	Leader WP3 (New rail freight service concept development); WP7 (Rail safety and security); and WP9 (Evaluation of RETRACK demonstration case). Also a partner in other WPs
7	TCI Roehling – Transport Consulting Internaitonal, DE	Partner role in multiple WPs
8	R4C – Rail4Chem, DE	Had an operating partner role but left after Veolia bought out the company, before the rail freight service started.
9	TP – Transpetrol, DE	Joined the project, as partner with operating role, before the rail freight service demonstration started.
10	CER – Central European Railway CO, HU	Operating role as a partner
11	SOP – SOPTIM, DE	Leader for WP4 (develop a suitable platform for IT systems).
12	LTE- Logistik –UND Transport GMBH, Austria	Operating role as a partner.
13	ST – Servtrans, RO	Had an operating partner role but became dormant before the rail freight service demonstration started.
14	Excellent SPOL S.R.O. established in Cyklisticka 13, SK -04001 – Kosice (Slovakia)	Excellent became a 3rd party of operating partner Transpetrol, who acquired the company.
15	ERSA European Rail Software Application, FR	Had a partner role but became dormant.
16	NEA Transport Research and Training, NL	Joined the project at a later stage. Leader of WP 13 (Rail freight service developments in China and Russia and the impact on Europe); and a partner in WP12.
17	W& H - Wagener & Herbst GMBH, DE	Had a partner role but became dormant.
18	ARCH Archicom Romania, RO	Had a partner role but became dormant.

2.2 Project Management

The RETRACK project covered a wide variety of subject areas such as logistics, technical and operational aspects, including interoperability, ICT and border crossing formalities. The management of the project consisted of experts covering these areas. Of the 18 partners, there were 12 partners involved in the R & D activities and the remaining six were assigned to operations. A transparent management structure, with decision-making capability and authority, was vital to the successful implementation of the project. Also essential to the

success of a complex project with as many partners as RETRACK, was a contact and communication line from the European Commission to consortium partners.
The main structure of the project was as follows:

Project Board - the main body of the project, which guided the scientific progress and consisted of the Project Manager (TNO), WP Leaders (DR, NewRail, TOI, and SOPTIM), Co-ordinator of the Pilot demonstration (Transpetrol) and Task Leaders (for the active tasks). The board met every 4 months, or more often if required.

WP Leaders - these were selected on the basis of their expertise, not only in the relevant scientific discipline, but also in the field of project management. There were a total of 13 (11 in the original DoW) WPs, each with a number of tasks, led by a task leader. The WP Leaders and their associated task leaders formed a WP committee, responsible for the quality and timely delivery of the respective outputs. The WP committee met at least twice a year.

Task leaders – were responsible for the work carried out within their tasks. They performed and monitored the progress of the activities at the task level and were responsible for delivering quarterly progress reports to the relevant WP Leader(s). They were also responsible, within their own organisation, for the resolution of issues related to resource and budget allocation. Task meetings took place as often as required by the nature of the work and the status of the project.

2.3 Pilot demonstration of the rail freight service

Transpetrol was the Co-ordinator of the RETRACK Pilot demonstration. Several changes were made to the composition of the operational partners during the implementation of the project, for a variety of reasons. The operational partners of the RETRACK rail freight service are listed below:

- European Bulls (Netherlands) - wound down as an organisation and left before the rail freight service operation began;
- TransPetrol GmbH (TP) (Germany) – joined the consortium at a later stage, during the service development; played an important role from the start, in implementation as well as in the successful completion of the pilot demonstration of the rail freight service;
- Rail4Chem (Germany) - left before the rail freight service started, after Veolia bought out the company;
- LTE (Austria); continuous role as an operational partner;
- CER (Hungary); continuous role as an operational partner, and
- Servtrans (Romania) – became dormant at the early stage of the service development..

2.4 Progress beyond state of the art

The highlighted changes to the consortium composition show the volatility of small companies, the changing make-up of the rail freight transport sector, as well as typical risk in the formation of a consortium for a pan-European project - less-than-clear roles and responsibilities of the operating partners for the service development and the fact that pilot demonstration and subsequent implementation constituted unknown territory. Typically, to respond to an EU R&D call topic different, previously known to each other core partners form

a consortium, some of them with no prior experience of working together. Mostly, the partners work together as previously agreed (and prescribed in the DoW) but there can be problem areas, for example: an incompetent representative of a partner; a partner being bought by another company and thus introducing a new, late-entry representative; facing new challenges, such as bankrupt partner, or a new economic reality, such as recession. In many cases, the research and consultancy partners play the leading role in DoW preparation, as the operating partners have less time and fewer skills to dedicate to the process. This can lead to some operational issues - including operating partners' specific roles and responsibilities, or the necessity of a third party - being less than well-understood and/ or documented. After overcoming several such challenges, the RETRACK rail freight service was ultimately run by three operators, with clear roles and responsibilities and a revenue sharing agreement. These were TransPetrol (TP) (Germany); Logistiek und Transport GmbH (LTE) (Austria); and Central European Railways Zrt (CER) (Hungary), with the support of other R & D partners. Effectively TP was an integrator, with other extensive roles, including: hiring of crews; train planning; contact with customers; marketing; and train and cargo monitoring. To perform these roles, TP had a small office, staffed by only 3 managers; it is doubtful that incumbent operators can even imagine such low manning levels – a possible key learning point in its own right and a milestone for future such R & D projects. LTE provided traction (locomotive) for the service. Shunting and local traction services were provided by CER.

The original schedule of the pilot demonstration was to run a service between January 2008 and December 2010. However, following preliminary R & D works, the impact of a deep recession precluded the launch of a new rail freight service, as demand was falling and several anchor customers who had promised cargo to the RETRACK service were forced to pull out. This delayed the start of the service until February 2010, where after it continued until July 2012. Some of the partners became pessimistic about the future of the pilot demonstration, where others remained steadfast, but the project consortium overall must acknowledge the proactive role of the then EC Project Officer, who was optimistic, flexible, determined and very helpful in adapting to changes such as shortening of the corridor, changes to hubs and the addition of single wagon load service to feeder lines. Such changes were required both to reflect the changed circumstances, but also to attract and satisfy the needs of customers. To accommodate them, the DoW was revised and approved seven times by the European Commission – an unusual extent for projects implemented under the funding scheme, in particular in the rail freight sector. Even post such changes, there remained still many legal (e.g. time consuming mandatory inspection procedures at border crossings), institutional (e.g. multiple rail freight operators working together with clear roles and responsibilities to satisfy a single customer), technical (e.g. locomotive change, interoperability of rolling stock) and operational (e.g. path allocation, driver changes due to different language of the national rail network) barriers to a pan- European rail freight service, some of which remain, to some extent, today. In other sectors, many of these barriers have been resolved in Europe; for example, a truck driver can drive end to end without border-crossing formalities. In the rail transport sector in Europe, by contrast, this is still a burning issue; overcoming such barriers is indeed progress beyond the state of the art - some may even call it contextual novelty or innovation. From the experience of the RETRACK project it can be clearly seen that EU policy makers, funding authorities and indeed the major project partners all need to be aware of and take account of such challenges and be prepared to be flexible and to take a proactive - and pragmatic - approach to achieving objectives and goals.

3. RESEARCH APPROACH

The current research conducts a case study on the advances in the competitiveness of pan-European rail freight services run by new-entrant (private) operators. For the current research, a case study method was chosen to study and highlight the commercial experiences, implications and achievement of competitiveness of the rail freight service.

A case study can be defined as an empirical inquiry that investigates a contemporary phenomenon, in depth, and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2009). Gerring (2007 p.20) has a similar view. Case study is: 'The intensive study of a single case where the purpose of that study is – at least in part – to shed light on a larger class of cases' (ibid). The aim of case studies is also partly, through in depth studies of a case, to make generalisations to a larger set of cases and to develop hypotheses which can then be tested empirically. Eckstein (1975) emphasised that the selection of case studies could provide for maximum analytical leverage. A 'least likely' and 'most likely' approach can thereby make it possible to find robust support for theories and hypotheses. One advantage of employing case studies is that the method can handle a large set of complex relations that are context dependent (George and Bennett, 2005) and explain intricate and stable patterns, which demands comprehensive, exact and systematic accounts. Moreover, case studies can be used to explain a phenomenon and to analyse the results in a larger context.

Three phases can be identified within a case study research process. The first phase is the definition and design of the research, where the theoretical background is set out, including selection of cases and the design of data collection protocols. For this paper the background information on rail freight services is discussed in section 3. The second phase covers preparation of a data collection template or questionnaire, and the collection of data. The second phase for this paper is performed in sections 4 to 6. In the third and final phase, an analysis is conducted with the collected data, a summary of the findings from the analysis is made and conclusions are drawn, including the development of the (policy) implications of the results (Andersen, et al., 2012). Here, section 7 summarises the findings of the comparative study and section 8 includes some conclusions and recommendations.

4. DATA COLLECTION AND ANALYSIS

Data on the RETRACK rail freight service were collected from two sources. The first data source is the data on rail freight service operations, collected from the pilot diary (in Excel spread sheet format). For the current research, the data on the RETRACK rail freight service were for two years (February 2010 to February 2012) although the service ran until July 2012 on the Cologne - Györ corridor (see again Figure 1). The second data source for the RETRACK rail freight service is the customer satisfaction survey. Using a questionnaire, data were collected from RETRACK customers to gather their opinion on the rail freight services on the corridor.

4.1. Data on RETRACK rail freight service operations

During the operation period of the RETRACK rail freight service, a diary was kept containing details of all train runs. Also Transpetrol sent data, every month, to the relevant partners (i.e. TNO, NewRail). The pilot diary contained the following types of train data:

- Direction of trains on the main track:
  - Györ to Cologne (East to West);
  - Cologne to Györ (West to East);
  - Hegyeshalom to Cologne;
  - Cologne to Hegyeshalom;
  - Passau to Cologne;
  - Cologne to Passau;
  - Hegyeshalom to Passau; and
  - Passau to Hegyeshalom
- Train number (e.g. RETRACK 0001);
- Date, day and time of planned and actual departure and arrival at terminals and hubs;
- Remarks connected to disruptions;
- Customer size (in terms of number of wagon loads);
- Consignment in (net and gross) tonnes;
- Number of wagons; and
- Number of customers per train

4.2. Survey questionnaire and RETRACK customer satisfaction survey

The following types of questions were asked of the RETRACK service users (respondents):

- General questions (respondent's profile);
- Shipment and quality of RETRACK rail freight services; and
- Service attributes of rail freight service providers in the RETRACK corridor.

There are many factors or attributes that attract shippers to select freight transport services. There are variations in the attribute choice generally due to, among others, the type of goods or products to be transported. Generally, voluminous and lower value cargo can accept a longer transit time. In contrast, high value products (e.g. automobile parts) and time sensitive products (e.g. perishable goods - flowers) need to be transported comparatively quickly. Also, shippers may use the transport chain as a moving warehouse, in which case a longer transit time can represent added value to the shipper. The size and frequency of the consignment may also influence the choice of transport mode(s). To identify such attributes, different research has employed different methods, including literature survey; interviews; focus group discussion; unscientific syntheses of previous studies; and so on (Cullinane and Toy, 2000 p. 41). There is no consensus about which factor(s) are most important in determining transport service choice. Using top down (secondary data analysis) and bottom up (interviews) approaches, Islam et al. (2010 p. 24-25) identified the following requirement for competitiveness of rail freight service: price; transit time; (transit time) reliability; safety and security of cargo (against loss and damage); and tracking and tracing. To attract cargo from road, they suggested that an intermodal, door-to-door rail freight service should be 10-15% cheaper than the road freight transport price. Applying a content analysis of 75 articles, Cullinane and Toy (2000 p. 49) ranked the following top five attributes: cost/price/rate; speed; transit time (reliability); characteristics of the goods; and service level (unspecified). Using Delphi study, Zunder and Islam (2011 p. 59) found that a cargo tracking and tracing system is

an important attribute for freight service operation. Using multiple analysis methods, Cullinane and Toy (2000 p. 48-52) found that flexibility; frequency; capacity; and controllability/traceability are further very important attributes.

CER (2013 p.12) reports that the sustainability is not a top priority for freight customers, who favour price and reliability. In order to compete effectively and take a significantly greater proportion of medium and long distance freight, the challenge for rail is structural change, to make it competitive and attractive (EC, 2011 p.7). To assess the performance of transport companies' services, using a benchmarking online tool - 'Logistics Benchmarking Tool', available at http://www/be-logic.info - Islam et al. (2013) used a number of attributes (key performance indicators). These were:

- Transport cost, with sub-indicators of: vehicle/vessel cost; fuel/energy cost; infrastructure charge; cleaning cost; terminal/handling cost; handling fee for loading and unloading; terminal charge; container rent; inspection cost; insurance; overhead cost; inventory cost; and other cost;
- Transport time, with sub-indicators of: handling time; driving/sailing time; and waiting time;
- Flexibility, with sub-indicators of: demand adaptability; timetable adaptability; size adaptability; and robustness;
- Reliability, with sub-indicators of: punctuality; transit time variation; reputation; and complaints;
- Quality, with sub-indicators of: tracking and tracing ability; payment terms; quality systems preference; invoice accuracy; proof of delivery – POD; and confirmation of delivery – COD; and
- Sustainability, with sub-indicators of: Co2; So2; PM10; Nox; and Nmh.

Giannopoulos (2004 p.312) discussed the importance of access to information systems (e.g. via the internet) as well as the flow of information such as transport timetables, route guidance, real-time transport alerts and stops/terminals near to origin or destination. Cullinane and Toy (2000) studied the following attributes: cost/Price/Rate; service (unspecified); transit time reliability; frequency; distance; speed; flexibility; infrastructure availability; capability; inventory; loss/damage; characteristics of the goods; sales per year; controllability/traceability; and previous experience. To determine attribute cut-offs in freight service selection, Danielis and Marcucci (2007 p. 510) noted the following seven attributes: freight cost; door-to-door transit time; late arrivals (reliability); loss and damage; flexibility; frequency; and transport mode options. In analysing qualitative attributes of freight transport, from a Stated Orders of Preference Experiment, Beuthe and Bouffioux (2008 p.109) noted six transport attributes: frequency; transit time; reliability; flexibility; loss; and cost. In determining the logistics managers' stated preferences for freight service, Danielis et al. (2005 p. 205) explored only four service level attributes: cost; transit time; risk of delay (reliability); and risk of loss and damage.

Table 2. Summary of attributes of freight transport services

Studies	Attributes
Beuthe and Bouffioux (2008 p.109)	Frequency; transit time; reliability; flexibility; loss; and cost.
CER (2013 p.12)	Price; reliability; and sustainability
Cullinane and Toy	Studied the following: cost/Price/Rate; service (unspecified);

(2000)	transit time reliability; frequency; distance; speed; flexibility; infrastructure availability; capability; inventory; loss/damage; characteristics of the goods; sales per year; controllability/traceability; and previous experience. Of these, the top five are: cost/price/rate; speed; transit time (reliability); characteristics of the goods; and service level (unspecified).
Danielis and Marcucci (2007 p. 510)	Freight cost; door-to-door transit time; late arrivals (reliability); loss and damage; flexibility; frequency; and transport mode options
Danielis et al. (2005 p. 205)	Cost; transit time; risk of delay (reliability); and risk of loss and damage.
Giannopoulos (2004 p.312)	Access to information systems; flow of information; route guidance; real-time transport alerts; and stops/terminals near to origin or destination.
Islam et al. (2013)	Transport cost; transport time; flexibility; reliability; quality; and sustainability
Islam et al. (2010 p. 24-25)	Price; transit time; (transit time) reliability; safety and security of cargo (against loss and damage); and tracking and tracing.
Zunder and Islam (2011 p. 59)	Cargo tracking and tracing

From the above discussion it can be argued that there are many attributes involved in selecting transport mode/service option/choice. Cullinane and Toy (2000 p. 41) opine that 'While there is a need to limit the number of attributes and attribute levels in order that the number of combinations (decision alternatives) presented to respondents is at a manageable level, it is also important that these variables are accurately identified and specified'. Considering the evaluation attempts by other R&Ds (see table 2) consulted above and the context of current R & D in rail freight service, the following nine attributes are included in the survey questionnaire to assess the competitiveness of RETRACK and its competing service:

- Price level;
- Transhipment time;
- Handling time;
- Reliability;
- Information flow;
- Flexibility;
- Accessibility of information;
- Frequency; and
- Available capacity.

In May-June 2011, after one year of RETRACK service operation, a satisfaction survey was conducted among RETRACK customers. (A copy of the semi-structured questionnaire used for the survey, can be collected from the lead author of this paper.) Due to their confidential nature, the data relating to cost and revenue/income of the rail freight service operation are not presented in this research. With interim data, Zunder et al. (2012 p. 1352)

reported that: ‘As at mid 2011 revenue is recovering circa 70% of total operating costs, plus overhead, and has been improving since early 2011’.

5. ASSESSMENT OF THE RETRACK OPERATION

This section presents four assessments of the RETRACK rail freight service, using pilot diary data. These are: general assessment; transit time; consolidation of RETRACK traffic and train departure schedules; and progress in the RETRACK rail freight service operation.

5.1. General assessment

The data from the diary suggest that most of the trains (63%) ran the entire route between Cologne and Györ; that 32% ran on a shorter route, between Hegyeshalom and Cologne; and that Passau was the start or end point for the 5% shortest train runs. The number of eastbound services on the Györ-Cologne-Györ corridor is higher than westbound. This is due to lack of goods for the westbound direction in some periods of the year. The number of (one-way) train departures per month increased from November 2010 (see Figure 2), but the number of wagons also increased substantially from the same date (see figure 3). There is a correlation between Figures 2 and 3. The monthly train data displayed in figure 2 consist of wagons displayed in figure 3. Thus both figures show a similar pattern.

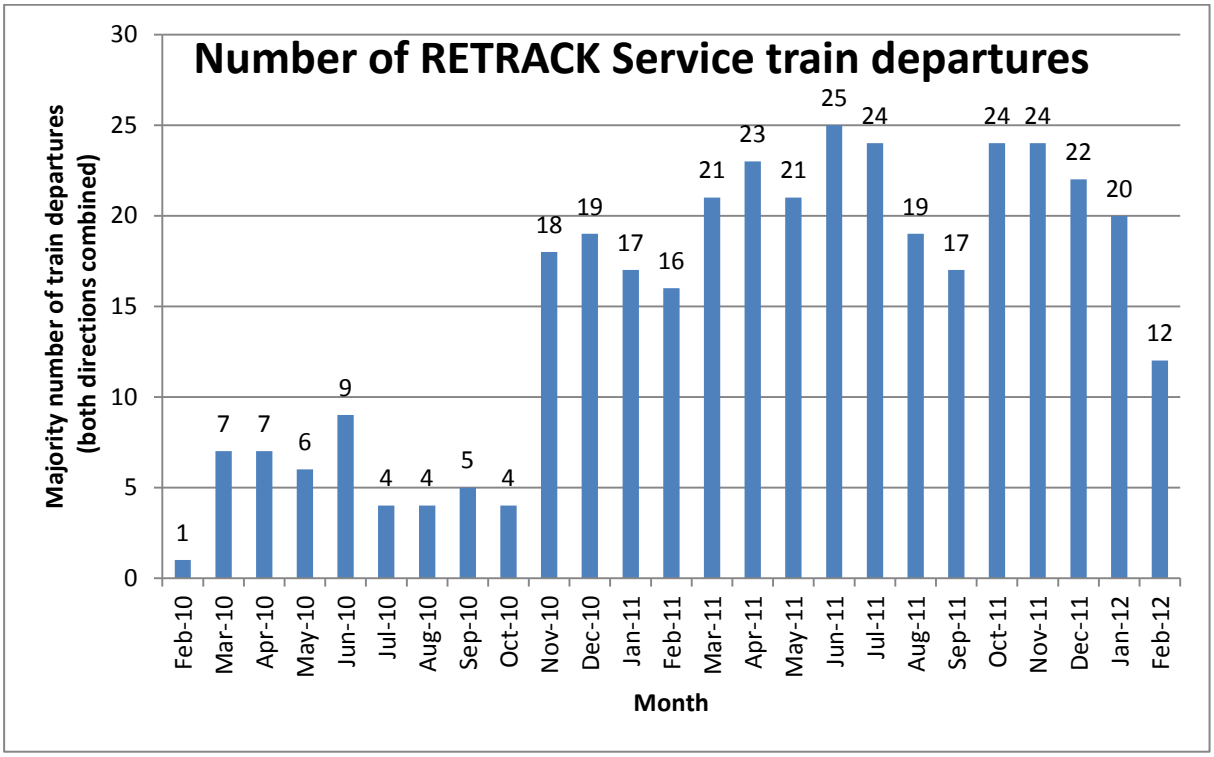

Fig. 2. Number of RETRACK freight service train departures, both directions combined

The composition of the train runs differed considerably, from one wagon load per train, to 46 wagon loads per train. The load ranged from empty (no cargo) to 1756 net tonnes per train. It can be noted that all wagons/ shipments/ volumes are not necessarily carried for the entire route, meaning that some of them were transported for shorter distances, for example between

Cologne and Passau or between Passau and Hegyeshalom. Others were for longer distances, for example between Cologne and Győr.

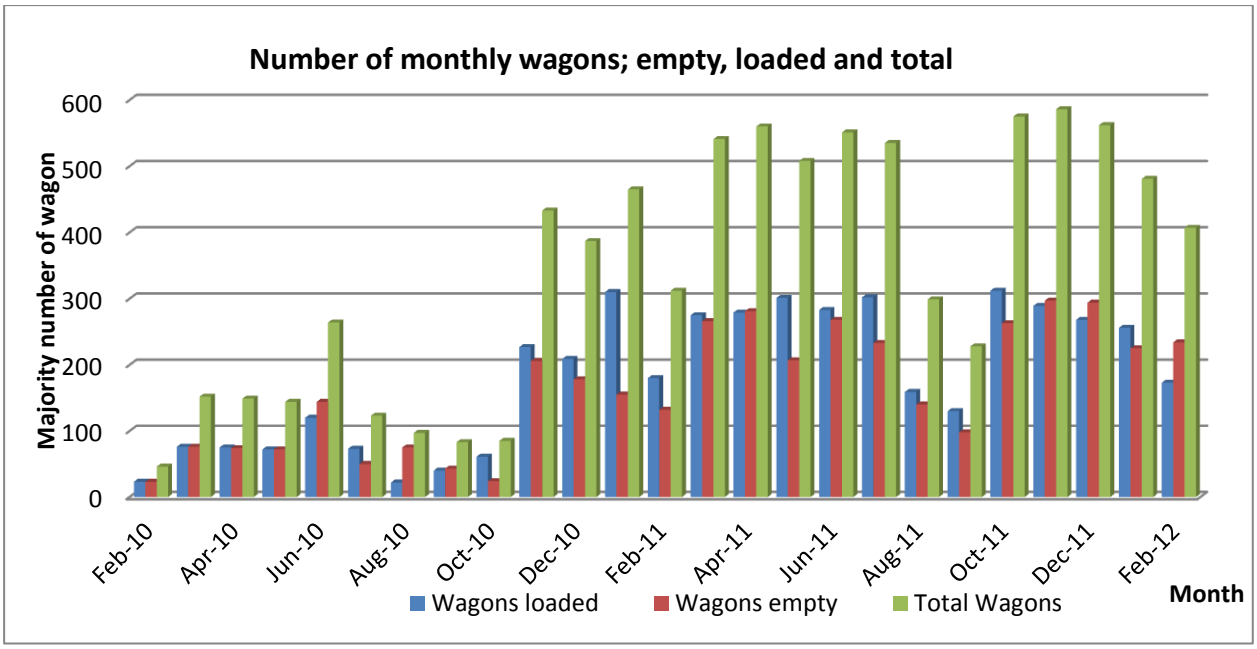

Fig. 3. Breakdown of number of monthly wagons; loaded, unloaded and total

Understanding the capability of the competitors is an important starting point for any business. This is particularly crucial when a new entrant operator, like RETRACK, looks to offer a service on a corridor where incumbent and bigger rail freight operators, such as DB, have been operating. The incumbent suppliers have developed customer relationships over the years of offering them service. Recognising their service quality (in terms of, for example, price, transit time, flexibility, and reliability), as well as their strengths and weaknesses, is vital to the new-entrant; the challenge then being to develop a suitably competitive service offering that will attract the attention of customers. This challenge is even greater when competing with road freight transport service providers, who are able to offer customer-oriented, door-to-door, flexible service, on the same corridor. It seems from the pilot demonstration that the RETRACK operators could not yet overcome this last point.

5.2. RETRACK transit time

The complexity and variability of the demand served by the RETRACK rail freight service were important factors that contributed to variations in the transit time (see Table 2). On the Győr - Cologne - Győr route, the eastbound (Cologne to Győr) transports were performed somewhat faster than the westbound (Győr to Cologne). However, the average transit time in both directions is lower than the average 2 days per trip transit time predicted in an interim analysis of the project, reported in Woroniuk et al. (2013. 90). The positive contrast in mean transit time demonstrates the positive progress of the RETRACK rail freight service operation in the medium term. It can be expected that the future operation will be even faster, with lessons learned in overcoming the initial operational difficulties, as reported in Zunder et al.

(2012 p. 1349-1350). Thus the service will be able to attract more customers who need a faster (as well as reliable) transit time.

Table 2: Transit time variation (in hours) on different RETRACK service routes

Route	Mean	N	Std. Dev	Min	Max	Median	Distance km	Average speed/hour
Györ - Cologne	32.97	105	15.016	20.07	141.85	28.05	1220	37.0
Cologne - Györ	27.76	122	14.870	17.07	172.73	25.13		
Hegyeshalom - Cologne	19.88	58	2.513	15.50	27.55	19.35	1168	58.7
Cologne - Hegyeshalom	20.37	58	5.701	15.75	55.83	18.85		
Passau - Cologne	10.78	10	0.931	9.03	11.80	11.03	793	73.5
Cologne - Passau	13.11	6	3.151	9.73	18.92	12.18		
Hegyeshalom - Passau	5.83	1		5.83	5.83	5.83	375	64.3
Passau - Hegyeshalom	12.05	1		12.05	12.05	12.05		

Legend: N stands for number of instances of RETRACK service

On the Cologne - Hegyeshalom - Cologne route, the eastbound services had a slightly higher transit time than the westbound service. On the Passau - Cologne - Passau route, the westbound transports were the faster, although it had relatively fewer consignments.

The fastest transit time on the eastbound Cologne - Györ - Cologne route was slightly more than 17 hours, while 20 hours was the fastest transit time for the westbound Györ - Cologne - Györ route. The reasons for the variations in transit time are multiple. In the services with shorter transit times, the train carried little load and several empty wagons, and may effectively be regarded as operating empty. Also, the longest transit time was approximately 142 hours on the westbound Györ - Cologne - Györ route and 173 hours on the eastbound Cologne - Györ - Cologne route. On services with the longer transit time, the train faced a number of issues (for details please visit Zunder et al., 2012 p. 1349-1350), including technical problems with the locomotive; late arrival of single wagon loads, or group wagon loads, at the hubs; bureaucratic border crossing formalities, such as container/wagon inspection; and driver change, which is an important barrier in pan-European rail freight service operations. Without certification issued by the national regulator in the (foreign) European Member State, driver change is mandatory. To eliminate the bureaucratic barrier, it is proposed, in the Fourth Railway Package (EC, 2013), that this certification be issued by ERA. This will contribute to faster transit time, as well as to a lower cost of operation.

Table 3 Dwell time and transit time (in hours) on Westbound Györ-Cologne route

Activity	Location	Mean	N	Std. Deviation	Min.	Max.	Median	Distance km	Average speed

Dwell time	Györ terminal	4.61	53	15.586	0	111.83	1.17	n/a	
Transit time	Györ - Hegyeshalom	2.49	108	5.112	0.47	42.25	0.87	52	20.9
Dwell time	Hegyeshalom terminal	10.07	110	12.947	0.83	105.03	5.70	n/a	
Transit time	Hegyeshalom – Passau route	7.75	109	7.251	3.85	77.83	6.82	375	48.4
Dwell time	Passau terminal	2.08	110	2.927	0.02	21.45	1.30	n/a	
Transit time	Passau - Cologne	11.43	107	1.738	8.22	20.00	11.08	793	69.4
Dwell time	Cologne terminal	18.35	102	24.126	0.68	180.58	11.83	n/a	

Legend: N stands for number of instances of RETRACK service

The longest transit time was also due to the fact that some long journeys can be run intentionally at a slower speed, because the train was actually able to depart earlier than planned schedule. In some cases, trains were postponed, due to non-urgent customer demand. Of the total transit time on the core corridor Györ-Cologne-Györ, the study finds that the dwell time spent at Hegyeshalom (Hungary - Austria border) was relatively longer on the westbound Györ to Cologne route. The transit time spent at this border crossing constitutes 30% of the average transit time for the westbound service and 21% for the eastbound, which explains the previously noted variations in the transit time between westbound and eastbound trains. In general, stoppages at hubs and multiple border crossings account for most of the variations in total transit time and are also the primary reasons for longer transit times.

5.3. Consolidation of traffic and train departure schedules

The rail yards in Cologne and Györ are used as hubs, with coupling and decoupling of trains and single wagons and the shunting of single wagons very time consuming and costly. It is estimated that shunting one single wagon takes 0.5 hours. Reviewing Table 3, it can be noted that the turnaround time at each of the rail yards in Györ is shorter than other yards (e.g. Cologne and Hegyeshalom). This is achieved by conducting efficient coupling and decoupling of single wagon loads and group wagon loads. The longer time at hubs as well and border crossing delays are important barriers to rail freight operation, decimating the value of the service.

In the Györ rail yard, westbound trains with grain and single wagon loads from Hungary, Romania and Slovenia, are gathered for customers located in The Netherlands, Belgium and Germany. In Cologne, eastbound trains, and wagons from customers located in The

Netherlands, Belgium, Germany and Austria, are coupled and decoupled to new trains, with destinations in Hungary, Romania and Slovenia.

After an initial eight months with fewer than 10 train departures (i.e. fewer than 5 in each direction) an abrupt increase in the frequency of departures began in November 2010 (see figure 2). During the second year, the number of one-way departures was between 15 and 25 and included longer periods where departures took place every day.

The direction of freight flows was quite uneven, with westward volumes more than 3 times those transported eastwards. This uneven flow had implications for the activities carried out at the hubs. In addition, an incompatibility of rail wagons was created between eastward and westwards transport, since rail wagons used to transport corn and soya pellets westwards could not be used to transport many of the eastbound high value commodities.

The coupling and decoupling in Cologne was concentrated on Mondays, Tuesdays and Saturdays, while in Győr the main loading and unloading activities took place on Sundays, Tuesdays and Saturdays. This meant that the feeder and distribution transport to and from the hubs (performed in collaboration with other rail companies) was carried out on the days before coupling and decoupling in the rail yards in Cologne and Győr.

A normal scheduled train was planned, with a consolidation time of 12-24 hours and 2 hours in the rail yards in Cologne and Győr. An example of the effect upon rail yard operation and dwell time was the delayed arrival of trains. Delay might occur due to technical problems (such as locomotive failure, or other problems with the engine or wagons), or track unavailability (due to accident, extreme weather conditions or infrastructure breakdown).

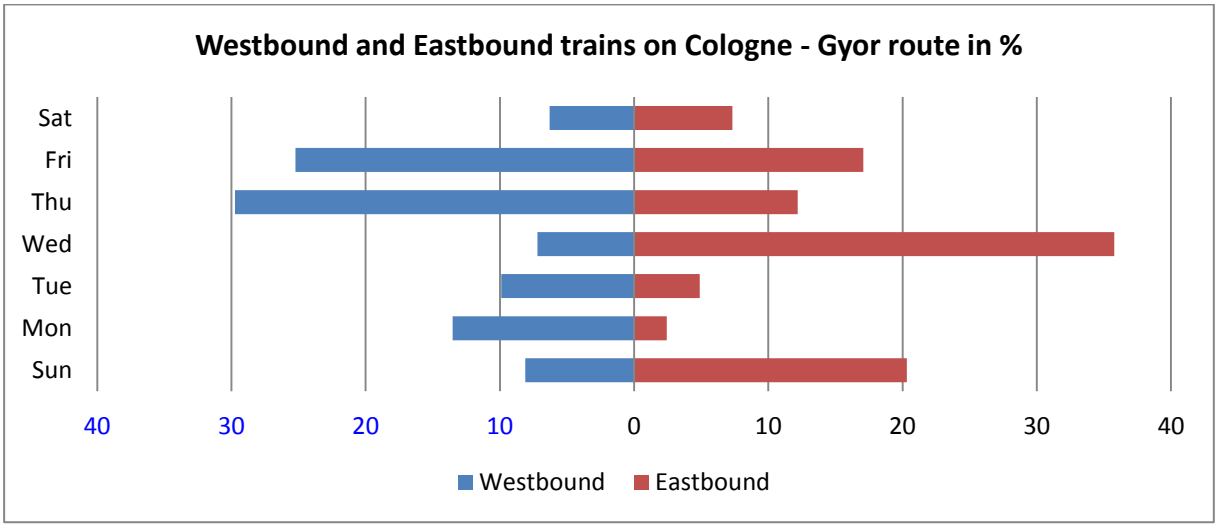

Fig. 4. The percentage of Westbound and Eastbound trains on the Cologne - Győr route, by day of the week

On the Cologne - Győr - Cologne route (traffic consolidated up to the previous day) Wednesday was the highest (36%) train departure day from Cologne (see Figure 4). On the Győr - Cologne - Győr route, the departure from Győr was mostly on Thursdays and Fridays (jointly accounting for 55%). On the Hegyeshalom - Cologne - Hegyeshalom route, Saturdays (westbound, 41%) and Wednesdays (eastbound, 43%) were the most frequently used departure days (see figure 4).

5.4. Progress in the RETRACK rail freight service operation

Over the two years of the RETRACK rail freight service operation, some positive developments were observed. The number of regular customers increased in the second year, from one (from Györ) to several regular customers with one and/ or several shipments, plus several one-time customers. Also, the market coverage was expanded geographically. While the number of origins for freight departures was slightly reduced from 15 to 14, the number of destinations grew from 13 to 17. This expansion was most noticeable at the eastern end of the corridor.

Comparing the performance of the rail freight service between the first year (February 2010 - February 2011) and second year (March 2011-February 2012) the RETRACK (2012) final report suggests advances/growth (see Table 4) in all transport indicators:

Table 4. Advances of RETRACK rail freight service

Indicators/ characteristics	Growth between first and second year
Increase in train departures	115%
Increase in freight volumes	81%
Increase in transport (tkm) on feeder lines	60%
Increase in transport (tkm) on main line	111%
Total increase in feeder and main line distribution transport (tkm)	80%
Increase in transport (tkm), feeder and main line distribution, based on Western hub Cologne	71%
Increase in transport (tkm), feeder and main line distribution, based on eastern hubs	85%

During the operating period of two years, a total of 369 trains were run (181 westbound and 188 eastbound). Starting with only one weekly departure, the frequency of the RETRACK service had increased substantially by November 2010, growing to three train departures per week in the second year. At the same time, the travel distance for a train in the core corridor was gradually reduced, by an increased use of the second hub point Hegyesahlom (Hungary) as the eastern hub, instead of Györ (Hungary).

Train departures were not subject to a fixed schedule of days and/or hours, although departure times for eastbound trains appear more consistent than westbound. This is also the case for trains using Hegyeshalom as the hub, versus those running to/from Györ. The Cologne – Györ - Cologne transit time of over 24 hours proved a disadvantage to the operation of a fixed timetable, especially a daily departure schedule. A high degree of variation in transit time - mostly related to the dwell times at hubs and border crossing points - added to the scheduling challenges, as well as affecting the reliability of customer service.

6. ASSESSMENT OF RETRACK AND COMPETING SERVICES

This section contains two types of assessment: opinions on the performance of the RETRACK rail freight service during the period February 2010 to February 2011 and RETRACK customers' opinions on competing freight services (using the customer satisfaction survey).

As the customer satisfaction survey was conducted in May-June 2011, it should be noted that the assessment might reflect some opinions formed over a longer period than the one-year

period stated, while others will reflect a shorter-term experience. The survey did not collect opinion from non-RETRACK customers, thus it has not been possible to report their opinions. At the time of the survey there were thirteen RETRACK customers; of these, nine completed and returned responses for analysis. Some parts of the questionnaire yielded higher response rates, while others were sparsely filled in. The small sample size means it is difficult to reach concrete conclusions, since a change to one respondent's opinion will cause a significant difference to the findings.

6.1. Customer satisfaction survey respondent profile

All nine respondents were reported as regular and frequent users of the RETRACK service. Of these, five customers were weekly, while the others were either monthly (two) or less frequent RETRACK rail freight users. Four customers began using the service in 2010, while the remaining five customers entered in 2011, meaning that, for these respondents, the survey covers a relatively short period of experience. The survey respondents were considered experienced rail customers, as eight out of nine possess rail sidings and most of the RETRACK shipments used these sidings as origins and/or destinations. One shipper did not have a siding and accessed the rail terminal by truck.

Overall, the typical RETRACK shipment in the survey seems to be long distance, relatively large volume, with origins/destinations in Germany and Hungary. Some origins/destinations of consignments were located in The Netherlands, Austria and Romania, which were served by feeder services.

Five out of nine respondents had shipments containing chemicals, petroleum, automotive, aluminium slabs or aluminium oxide, some of which products are characterized as dangerous goods. The other four respondents were shippers of different products and materials, such as corn and soya pellets. The shipment volumes ranged from one wagon load (around 50-55 tonnes) upwards. In total, the customers shipped an estimated volume of 29 000 tonnes using the RETRACK rail freight service.

The survey reports pre-booking information to be somewhat scarce - unsurprising since the operators were new-entrant, small to medium size enterprises (SMEs) significantly smaller than incumbent operators and were not yet fully equipped or manned. The customers were asked to estimate the number of requests accommodated by the RETRACK service at short notice (1-2 days) but only one customer required this. The others either reported zero or left the question unanswered, which may indicate that the information is less available or that short notice bookings were less relevant, either for these customers or for typical rail freight customers in general.

6.2. Customer opinion on the RETRACK rail freight service

One out of nine respondents expressed the opinion that they were motivated to use the RETRACK service as an alternative to the existing incumbent rail freight service. Also the general term "service" appeared as a motivation for choosing RETRACK. Among the service related factors, the most frequently occurring were cost and price. Answering the open question 'What factors motivate you to transport these commodities using the RETRACK

transport service?' the following were the motivation factors, ranked highest to lowest by the number of statements made by the respondents:

- Price / Cost / Cost Effectiveness (6);
- Transit time (3); and
- Reliability (2).

These suggestions are in line with the recent findings of a report (CER 2013 p.12). Based on their experience, the respondents were asked to rate nine service attributes, on a five-point likert scale, where the ratings were expressed as 1 (very poor), 2 (poor), 3 (average), 4 (good) or 5 (excellent).

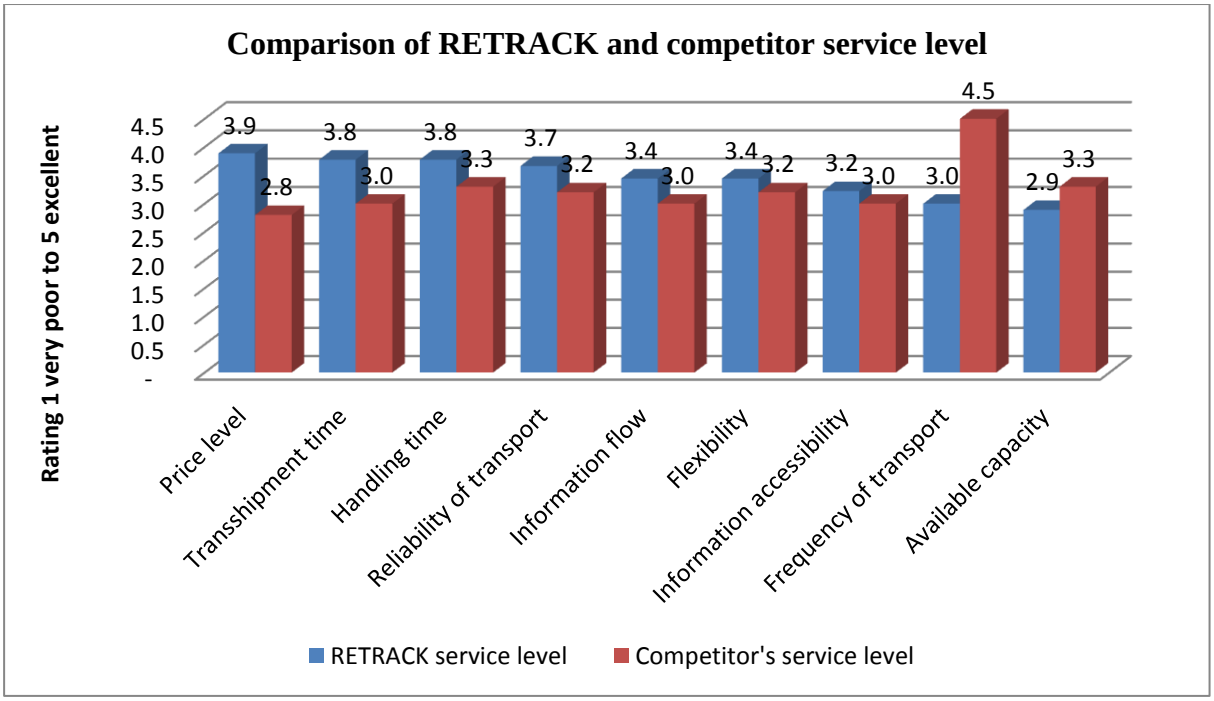

Fig. 5. Comparison of average rating of RETRACK and competitor service level

The top three RETRACK service factors were (see Figure 5): price level, transit time (both transhipment & handling) and reliability, where the mean scores approach 4 (i.e. 'good'). The remaining service factors scored close to 3 (i.e. 'average'), with frequency and availability of capacity gaining the lowest scores.

An indicator of success is the increase in the number of customers. From the start of the service, the number of customers increased from 1 (February 2010) to 14 (June 2011). The strongest growth in the customer base was during the autumn and winter of 2010/2011, with an expansion from 5 to 14 customers.

Responding to market needs (e.g. adding single wagon load service, changing the hubs that were not included in the original plan) is probably the key factor in achieving the improved performance level. Understanding and responding to customer needs was also behind the success.

6.3. Customer opinion on the competing services on the RETRACK corridor

Seven out of nine customers used rail-only for transports on the RETRACK corridor. The other two had used rail, road or intermodal transports prior to using the RETRACK service. Furthermore, seven out of nine customers consider rail as the only alternative mode to RETRACK. The remaining two customers consider road, short sea and intermodal transports as alternatives. From this, it can once more be observed that most of the RETRACK customers interviewed were experienced and stable users of rail freight services. This finding also indicates that the RETRACK service was less successful in attracting non-rail (e.g. road) customers. When asked to name their competitor service providers, all respondents mentioned other incumbent rail freight operators, either by name, or just as rail carriers in general (names protected here by confidentiality agreement). This may suggest that the intra-rail competition has progressed in the reformed railway freight market, which is probably a first step to becoming an active competitor in the wide European transport market. Further R & D will be needed to explore and contribute towards the ultimate goal of inter-modal competition.

When inquiring about the competing rail operators' advantages over RETRACK, only a few questions were filled in. Four of them mentioned higher flexibility and frequency. Other important factors mentioned were faster availability and shorter transit time.

The respondents were asked to rate the competing transport providers on the same service quality factors and using the same 1-5 likert scale as used to rate the RETRACK service. Six out of nine respondents provided information on the competitors' service quality factors (see Figure 5).

The frequency of transport stood out clearly as significantly the highest rated quality of service provided by RETRACK's competitors. Availability of capacity of the competing services is also stronger than for RETRACK. The most disadvantageous rating for RETRACK's competitors was the higher price level. Scores for the remaining service factors lie around the mid-level.

6.4. Customer interest in an extended RETRACK service

The respondents were questioned about their interest in the use of the RETRACK service if it were made available for additional destinations. The majority of respondents (six out of nine) were positive, with one 'maybe' and one 'no'. The respondents were also asked (open question) to express their opinions on what works well and what should be improved with the RETRACK service. Seven respondents answered this question. Most were positive, pointing out mainly short transit times and favourable prices. One respondent mentioned fast availability of containers at the terminals. However, most respondents used the opportunity to suggest improvements as well. One respondent wished for more available destinations and higher frequency. Some respondents stated that reliability/punctuality could be improved. Most demanded service improvement in general and improved information systems, in particular. On the information system, they provided a variety of suggestions, such as: booking information; updates on the goods in transit; proactive information; and better information flow.

7. FINDINGS

The current paper conducted an assessment of rail freight services run by a new entrant operator, from two aspects. First, the assessment of progress between the first and second year of the RETRACK rail freight service, using pilot diary data, and secondly assessment of a comparison between the RETRACK service and its unnamed competitors, on the same corridor, based on a customer satisfaction survey.

The assessment using pilot diary data covers the period from February 2010 to February 2012. The comparative assessment suggests that the frequency and availability of the RETRACK service have improved over the months, in particular the increase in train departures since November 2010. The transit time performance is highly variable, due to both train running times and dwell times at hubs and border crossings. The transit time variability of the RETRACK service may have affected one of the most important service quality factors – reliability - although this is no worse than its competitors. This may indicate that the transit time reliability factor lies partly outside of the control of rail freight operators (both new-entrants, such as RETRACK, and incumbent competitors such as DB Schenker) due to, for example, higher prioritisation of path allocation for passenger services and lower priority for freight services.

In the early part of the operation, the RETRACK service concentrated on the main corridor, assembling goods in the hubs in Cologne and Györ. Later on the service responded to market needs, for example by applying a hub and spoke (or satellite) service concept, by adding new feeder (with single wagon loads) and distribution lines, as well as by changing hubs, from Györ to Hegyeshalom, in order to achieve higher operational efficiency. By doing this, the RETRACK service has been able to compete on:

- Transit time with competing services;
- Transport prices;
- Frequency of service – by expanding from one to three trains, in each direction, every week; and
- Offering a customer oriented service that fulfils the requirements of new market segments, such as single wagon-load, and wagon group traffic.

As a consequence of this competitive ability, the RETRACK service has experienced the following successes:

- Increased freight volumes from existing customers and an increased number of regular customers;
- Shipments for one-time customers being continued into the second year;
- An expanded service on new feeder/distribution lines from both hubs; and
- An enlarged customer base in terms of cargo type (from low value grain to high value chemicals).

The respondents of the customer satisfaction survey were experienced rail customers and thus the shipments on the RETRACK service can be characterized as ‘typical’ rail shipments (i.e. large volumes and long distances). RETRACK’s competitors on the corridor were incumbent rail service providers. Thus the current evaluation of the rail freight service quality level is mainly about rail-to-rail competition and is less applicable to competition with other transport modes. It may be the case that the period of the new rail service attracted typical rail customers in the beginning and that the shift from other modes (in particular road) will be realized on a longer time horizon, if and when they become able to offer such services as door-to-door.

The findings of the customer survey (illustrated in Figure 5) suggest that the most highly valued RETRACK service factor was the price level, which was lower than its unnamed competitors on the corridor. Also, the RETRACK service was better in terms of transhipment and handling time, reliability and information flow/management. Frequency and availability of service were the lowest rated service qualities of the RETRACK service. In contrast, these two are the strongest service quality levels offered by its (incumbent) competitors on the corridor. In all of the remaining service levels, the RETRACK service performed better than its competitors. Taking the experience of the pilot demonstration of the service and assessment from two aspects, the study suggests that

- New entrant rail freight operators are able to operate pan-European rail freight service as well as single wagons and wagon groups;
- The customers appreciated the services and quality offered by the RETRACK operators;
- The RETRACK business model can be replicated elsewhere; but clear agreement on cost and benefit sharing will be vital for the venture;
- The RETRACK approach has led to knowledge transfer between operating companies, R&D organisations, policy makers;
- Access to terminals, sidings and infrastructure must be non-discriminatory (between incumbent and new entrant) and competitive and for that the policy makers and infrastructure managers have a great role to play;
- The new entrant operators will need European support for the start-up phase for such service operation on another corridor;
- The RETRACK has supported the European Commissions' transport and economic policies in terms of increased intra-rail competitive ability, but the modal shift aspect (from road) is yet to be achieved;
- To achieve the modal shift, the rail operators will have to offer services for, among others, non-rail cargo (i.e. LDHVs) matching road freight service quality (discussed in section 2).

8 CONCLUSION AND RECOMMENDATIONS

The experience of the pan-European rail freight services indicates that new-entrant rail freight operators can run a pan-European rail freight service efficiently and effectively and can compete with other rail freight operators in the freight market by meeting key customer service requirements. The RETRACK operators adopted a flexible, pragmatic and market oriented approach that should be a lesson for future R & D managers. However, the RETRACK operators were not able to shift cargo from road, which is a key EC policy objective. Similar results were found in the CREAM project, part-funded by the EC (CREAM, 2012). Jackson et al (2013) found that currently most LDHVs are transported by road and that a significant proportion (from 8 to 12%) of the cargo (for distances over 200km) could be shifted to rail, subject to matching the service offerings (such as price, reliability, door-to-door). The findings of these rail freight projects (RETRACK and CREAM) suggest that the European rail freight operators (whether incumbents or new entrants) may have improved their competitiveness in the new competitive market environment, but that this is not yet good enough to compete with road freight transport. Given this experience, the research recommends that the pan-European corridor-based rail freight service development approach be followed, as supported by national governments and/ or the European

Commission (by part-funding as well as by helping to overcome challenges during project implementation). This corridor approach facilitates higher volume of cargo flow, for longer haul services which are important prerequisites for an effective rail freight service operation. However, the authors believe that, EU subsidies, will be necessary for such pan-European services - in particular those run by new-entrants – to succeed. At the early stage of such an operation on a new corridor, the European Commission should continue the financial contribution to new entrant rail freight operations, as promised by the Commission of the European Communities (2009, p.5). This will enable advances in the achievement of two important European transport policy objectives of the competitive and sustainable European freight transport market (EC, 2011 p.5). The authors recognise that subsidy is contradictory to competitive market policy. Brewer (1996 p.93) suggests that the requirements for a contestable market, including market entry and exit, is costless; entry involves very small or no sunk costs.

The deregulation of the Staggers Rail Act of 1980 made such provision that resulted in the improved productivity, freight volume and reduced freight rates in the US rail freight sector (AAR, 2012 p.5). The European rail sector is yet to achieve such reasonable and fit-for-purpose reform. Among the foci of the European Commission's Fourth Railway Package, issued 30 January 2013, was the facilitation of the less costly and hassle-free entrance (or exit) of new operators. The Railway Gazette (2014) reports that the European Parliament adopted by major amendments that have scaled back the reform proposals on the independence of infrastructure management and financial transparency within vertically-integrated holding group structures. With this development, the authors think that there will be a little change or improvement compared to the pre-Fourth Railway Package market environment. Brewer (1996 p.93) also suggests that all firms (incumbent and new-entrant) should be subject to the same regulations; that pricing practices in the market must prevent the use of responsive pricing by the incumbent operators. Thus, neither Member States, nor the European Commission, should distort the market by offering subsidies to operators. Rail freight transport requires huge (and largely sunk) capital investment, whether for an existing or for a new operator. By contrast, a new SME trucking company may start up a business with a comparatively small budget and must fulfil fewer requirements than a new entrant rail operator. A new rail freight (or passenger) operation requires a huge start-up fund, as well as having to fulfil other essential requirements e.g. obtaining an operating licence. It has already been noted that the European freight transport market is increasingly dominated by road freight transport. In contrast, the share of rail freight is small and is not increasing. Another reality is that, despite several EU Directives and reform packages since 1991, some incumbent operators (e.g. DB, SNCF) are not really private operators. The share of new-entrant operators is even more insignificant within the total of rail freight share/volume and such companies face many obstacles in attempting to enter the market, a fact noted by the European Commission and targeted to be eliminated/reduced (European Commission, 2013). Considering these aspects, the authors recommend that subsidies from Member States or the European Commission, such as a start-up fund, have an important role to play in creating, first an intra-modal market in the medium term and subsequently an inter-modal, competitive market in Europe.

The CREAM project consortium included an intermodal operator (or freight forwarder or cargo consolidator) from the outset and faced fewer challenges of the kind faced by RETRACK. The RETRACK consortium included Transpetrol, as an operating partner at a later stage, who effectively played the cargo consolidator role. This was essential and, without them, the project may not have seen success. Thus, future R & D project consortia should include such an integrator. The rail freight service primarily attracted existing rail freight customers. To attract customers from road to rail, it needs to significantly increase its competitiveness and attractiveness, by offering a matching service quality (e.g. price,

reliability, time, flexibility) and an extended service (e.g. door-to-door, point-to-point). The new-entrant operators can increase market share through enhanced co-operation with other service providers, including transport and logistics service operators, as 'the efficient arrangement of international transport chains becomes more and more important' (CREAM, 2012 p.20).

Through an informal discussion with the RETRACK operator, the authors understand that, although the pilot demonstration started in February 2010 with one customer, the RETRACK operators are continuing to sustain as well as expand the service, through greater appreciation of the regular offerings, and that the service is now an integral part of nearly every freight transport offered on the corridor. This update is particularly important, since the European Commission's support ended in August 2012 and the service is now (May 2014) a completely commercial operation. It will be interesting to see whether, in the near and far future, such innovative approaches by new-entrants become feasible and achievable on another European rail corridor.

8.1 Limitations of the study and further research

Readers are warned about some limitations of the research paper when considering the applicability of its findings. First is the limited number of survey respondents (nine) due to the fact that rail freight operators generally have fewer but higher volume cargo customers. The second limitation is that, due to a confidentiality agreement, the data on the cost and revenue/income of the operation are not presented; thus an important attribute/element of evaluating competitiveness is not explored in this research. A third weakness is that the customer satisfaction survey did not explore the relative importance of the service attributes. Future research will need to further explore the following issues:

The relative importance of the service attributes (such as time, cost, and reliability);

The essential competitive attributes between rail and road;

Whether such operational and commercial success can be achieved by new entrant SME operators on another pan-European rail freight corridor, with a different set of R & D and operational partners; and

Whether such operational and commercial success can be achieved by new entrant or incumbent operators for the transporting of high added-value goods

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